

**REMARKS**

Applicant has amended claims 1 and 2 to clarify patentable and non-obvious features of the claimed fluid composition for use in a refrigerating machine or in package air conditioners. The claim amendments are supported by the as-filed specification, e.g., Abstract and paragraphs [0199] and [0201]. No new matter has been introduced.

With regard to the objection to claim 2, the Applicant directs the Examiner's attention to page 94, line 10, i.e., as-filed claim 2, of the as-filed application dated September 01, 2006, wherein claim 2 reads as "a tetraester of pentaerythritol." In the present published application (US 2007/0257229 A1), claim 2 is incorrectly printed as reading "a tetraester of pentaeryffiritol." This is an error of the PTO printing office, not of the Applicant. Accordingly, the Applicant respectfully requests withdrawal of the objection to claim 2.

Applicant respectfully traverses the 35 U.S.C. § 103(a) rejection of claim 1 over Shimomura *et al.* (U.S. Patent No. 6,231,782) ("Shimomura") over Kawahara *et al.* (U.S. Patent No. 6,667,285) ("Kawahara").

Claim 1 recites, among other things, a fluid composition for use in a refrigerating machine comprising a polyol ester as a base oil.

The Examiner admits that Shimomura does not disclose a polyol ester as a base oil. Office Action, p. 3. The Examiner relies on Kawahara as purportedly teaching "a lubricating oil composition for refrigerators comprising a mixture of at least one aliphatic saturated branched -chain carboxylic monoalkyl ester and fatty acid polyol esters (polyol

ester as a base oil as recited in claim 1)." Office Action, p. 3. The Examiner concludes that "it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the refrigerant composition of Shimomura with the base oil mixture of Kawahara in order to enhance the hydrolytic stability and decrease the viscosity of the composition." Office Action, p. 3.

To establish a *prima facie* case of obviousness, three basic criteria must be met. M.P.E.P. § 2143, 8th Ed., Rev 7 (July 2008). First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. M.P.E.P. § 2143; *see also In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). Although the Supreme Court cautioned against an overly rigid application of "teaching, suggestion, or motivation" (TSM) approach, it also recognized that use of a teaching/suggestion/motivation approach to the question of obviousness "captured a helpful insight." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1739 (2007); *Id.* at 1741 (citing *In re Bergel*, 292 F.2d 955, 956-57(1961)). In its published examination guidelines, the PTO also stated that the TSM approach is a valid rationale for determining obviousness. *See* M.P.E.P. § 2141(III). Second, there must be a reasonable expectation of success. M.P.E.P. § 2143.02. Third, the prior art reference (or references when combined) must teach or suggest all of the claim limitations. M.P.E.P. § 2143. Further, "[t]he key to supporting any rejection under 35 U.S.C. § 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious." M.P.E.P. § 2142.

Shimomura discloses as Comparative Example 15, at col. 15, lines 49-51 and at col. 19-22, Table 6, a tetraester of pentaerythritol and an aliphatic acid mixture

consisting of 2-ethylhexanoic acid and 3,5,5-trimethylhexanoic acid as a base oil 15.

Shimomura also discloses as Comparative Example 16, at col. 15, lines 52-54 and at col. 21-22, Table 7, a tetraester of pentaerythritol and an aliphatic acid mixture consisting of n-pentanoic acid, n-heptanoic acid and 3,5,5-trimethylhexanoic acid, as a base oil 16. Shimomura further discloses at col. 19-22, Tables 6 and 7, that Comparative Examples 15, 16 in which polyol esters are used as a base oil show inferior heat stability/hydrolytic resistance and higher kinematic viscosity, as compared to Examples 1-13 wherein hydrocarbon oil and alicyclic polycarboxylic acid ester compound are used as a base oil, as disclosed in col. 15, lines 17-47. Shimomura discloses, in Comparative Examples 15, 16, that oil compositions comprising a base oil including a polyol ester have inferior properties compared to oil compositions without a polyol ester as a base oil. Shimomura, therefore, teaches away from the use of a polyol ester as a base oil, as recited in claim 1. A prior art reference that "teaches away" from the claimed invention is a significant factor to be considered in determining obviousness. M.P.E.P. § 2145(X)(D). Furthermore, references which teach away from the claimed combination, when read in their entirety, discourage a person of ordinary skill in the art from combining the references to obtain the claimed combination.

M.P.E.P. 2141.02.

Moreover, Kawahara discloses at col. 2, lines 53-62, the use of aliphatic branched-chain carboxylic acid monoalkyl esters because these esters are excellent in improving hydrolytic stability. Kawahara does not teach or suggest that polyol esters improve hydrolytic stability. One of ordinary skill in the art at the time of the invention, therefore, would not have been motivated to modify the composition of Shimomura with the base oil mixture of Kawahara in order to enhance the hydrolytic stability and

decrease the viscosity of the composition. The Examiner has failed to articulate a suggestion or motivation to combine the references, and hence the Examiner has failed to establish a *prima facie* case of obviousness over Shimomura in view of Kawahara. See M.P.E.P. § 2143(G).

Applicant respectfully traverses the § 103(a) rejection of claims 1-2 over Osumi *et al.* (U.S. Patent Application No. 2002/0123436) ("Osumi") in view of Schnur *et al.* (U.S. Patent No. 5,820,777) ("Schnur").

The Examiner admits that Osumi does not disclose or suggest the use of phosphorothionates, but asserts that "it would have been obvious . . . to modify Osumi with the additive of Schnur[, i.e., phsphorothionates,] in order to enhance the antiwear and extreme pressure properties of the composition." Office Action, page 4.

To establish a *prima facie* case of obviousness, a reasonable expectation of success is required. M.P.E.P § 2143.02. As disclosed in the as-filed specification, e.g., Tables 1, 4, 5, 7, and 8, the compositions recited in amended claims 1 and 2 have superior unexpected beneficial results, i.e., superior anti-wear property, friction property, and stability, in comparison with examples that do not have a phosphorothionate in combination with a phosphorus-based additive other than the phosphorothionate. For example, Example No. 2 containing the combination of a phosphorothionate (Additive 2) and a phosphorus-based additive other than the phosphorothionate (Additive 1) shows superior results, i.e., less amount of wear and smaller coefficient of friction, in comparison with Comparative Example No. 5 using, without a phosphorothionate (Additive 2), a phosphorus-based additive other than the phosphorothionate (Additive 1). Similar results can be observed by comparing Example No. 5 and Comparative

Example 11; and Example No. 19 and Comparative Example No. 17, as shown in the table below, which is generated from Tables 1, 4, 5, 7, and 8.

	<b>Ex.2</b> (with a phosphorothionate)	<b>Comp.Ex. 5</b> (without a phosphorothionate)	<b>Ex.5</b> (with a phosphorothionate)	<b>Comp.Ex. 11</b> (without a phosphorothionate)	<b>Ex. 19</b> (with a phosphorothionate)	<b>Comp. Ex. 17</b> (without a phosphorothionate)
<b>Amount of wear (mg)</b>	6.2	13.8	5.8	12.4	7.9	9.2
<b>Average Coefficient of friction</b>	0.127	0.138	0.126	0.136	0.120	0.124
<b>Acid value</b>	n/a	n/a	n/a	n/a	A	B

Moreover, amended claims 1 and 2 recite, among other things, a hydrofluorocarbon refrigerant. Osumi discloses, e.g., at paragraph [0008], a refrigerating machine oil for use with a CO<sub>2</sub> refrigerant. Schnur, in contrast, discloses at col. 10, lines 54-57 and Abstract, using a hydrofluorocarbon(HFC) refrigerant, i.e., 1,1,1,2-tetrafluoroethane having a formula of CH<sub>2</sub>FCF<sub>3</sub>. It is a common knowledge to one of ordinary skill in the art that the polarity of hydrofluorocarbon such as 1,1,1,2-tetrafluoroethane having a formula of CH<sub>2</sub>FCF<sub>3</sub> is different from the polarity of CO<sub>2</sub>, which is non-polar. See also *CRC Handbook of Chemistry and Physics*, p. E-61 (68th ed. 1987) (a copy of which in relevant portion is attached). Because one of ordinary skill in the art would not expect similar chemical properties between the compounds with different degree of polarity, one would not have reasonably expected successful beneficial results from modifying a fluid composition for using with a CO<sub>2</sub> refrigerant, as taught by Osumi, to add a phosphorothionate, which is used as additive in oil compositions for using with a HFC refrigerant, as taught by Schnur. See M.P.E.P. § 2143.02.

Accordingly, no prima facie case of obviousness has been established with respect to claims 1 and 2 in view of the combination of Osumi and Schnur. See M.P.E.P. § 2143.

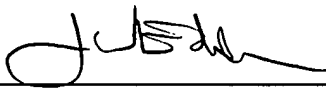
In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration of this application, withdrawal of the rejections, and timely allowance of the pending claims.

If there is any fee due in connection with the filing of this Statement, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,  
GARRETT & DUNNER, L.L.P.

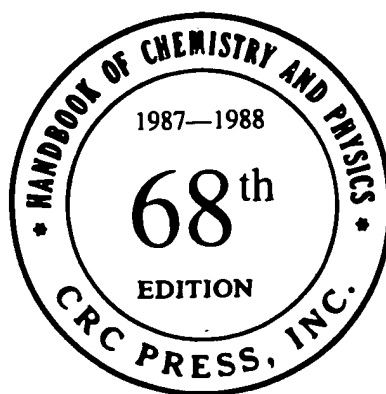
Dated: May 26, 2009

By:   
James W. Edmondson  
Reg. No. 33,871

**Attachment: *CRC Handbook of Chemistry and Physics*, p. E-61 (68th ed. 1987)**

# CRC Handbook of Chemistry and Physics

A Ready-Reference Book of Chemical and Physical Data



Editor-in-Chief

Robert C. Weast, Ph.D.

Associate Editors

Melvin J. Astle, Ph.D.  
William H. Beyer, Ph.D.

In collaboration with a large number of professional chemists and physicists whose assistance is acknowledged in the list of general collaborators and in connection with the particular tables or sections involved.



CRC Press, Inc.  
Boca Raton, Florida

## DIPOLE MOMENTS

The method of measurement of the dipole moments is indicated in the following two tables by the symbols:

- B benzene solution  
C carbon tetrachloride solution  
D 1,4-dioxane solution  
H n-heptane solution  
St measurement of Stark effect in microwave spectrum of gas

Dipole Moments for Some Inorganic Compounds

Dipole Moments for Some Organo-metallic Compounds

Compound	Dipole Moment $\times 10^{-18}$ e. s. u.	Method	Compound	Dipole Moment $\times 10^{-18}$ e. s. u.	Method
AlBr <sub>3</sub>	5.14	B	Beryllium diethyl	1.0	H
AlI <sub>3</sub>	2.48	B	Cadmium diethyl	0.3	H
CaCl	10.42	St	Mercury diethyl	0.0	H
CaF	7.875	St	Magnesium diethyl	4.8	D
HF	1.92 $\pm$ 0.02	..	Zinc diethyl	0.0	H
HCl	1.084 $\pm$ 0.003-0.007	..	Beryllium diphenyl	1.6	B
NBr	0.78	..	Cadmium diphenyl	0.6	B
HDBr	0.62	St	Mercury diphenyl	0.2	B
HI	0.38	..	Magnesium diphenyl	4.9	D
DCI	1.084 $\pm$ 0.003-0.007	..	Zinc diphenyl	0.8	B
HNO <sub>3</sub>	2.16	St	Chromium (0), diphenyl	0	B
HgBr <sub>2</sub>	0.95	B	Chromium, ditolyl	0	B
HgCl <sub>2</sub>	1.23	B	Cobalt, mononitrosyl tricarbonyl	0.72	B
H <sub>2</sub> O	1.87	..	Cyclopentadienyl, chromium dicarbonyl		
H <sub>2</sub> O <sub>2</sub>	2.13 $\pm$ 0.05	..	mono nitrosyl	3.23	B
H <sub>2</sub> S	1.10	..	Cyclopentadienyl, manganese tri-		
SO <sub>2</sub>	1.60	..	carbonyl	3.30	B
SO <sub>3</sub>	0.00	..	Cyclopentadienyl, cobalt ducarbonyl	2.87	B
SO <sub>2</sub> F <sub>2</sub>	1.110	St	Cyclopentadienyl, vanadium tetra-		
NH <sub>3</sub>	1.3	..	carbonyl	3.17	B
N <sub>2</sub> H <sub>4</sub>	1.84	..	Penta cyclopentadienyl, dicobalt	0	B
NO	0.16	..	Dicyclopentadienyl, iron (II)	0	B
NO <sub>2</sub>	0.29	..	Dicyclopentadienyl, lead (II)	1.63	B
N <sub>2</sub> O	0.37	..	Dicyclopentadienyl, tin (II)	1.02	B
NOCl	1.83	..	Ethyl lithium	0.87	B
NOBr	1.87	..	Iron, dinitrosyl dicarbonyl	0.95	B
PCl <sub>3</sub>	0.90-1.16	..	Iron, tetracarbonyl-diiodide	3.68	B
PCl <sub>5</sub>	0.0	..	Iron, tetracarbonyl mono-(methyl		
CO	0.10	..	isonitrile)	5.07	B
CO <sub>2</sub>	0.0	..	Iron, pentacarbonyl	0.63	B
SiD <sub>3</sub> F <sub>2</sub>	1.53	St	Iron, bis(p-chlorophenyl cyclo-		
SiH <sub>3</sub> F <sub>2</sub>	1.54	St	pentadienyl	3.12	B
SnCl <sub>4</sub>	0.95	B	Ruthenium (II), di-indenyl	0	B
SnI <sub>4</sub>	0	B			
TiCl <sub>4</sub>	0	C			

## Dipole Moments

Dipole Moments of Amino Acid Esters

Substance	$\mu \cdot 10^{18}$ e. s. u.
Glycine ethyl ester	2.11
$\alpha$ -Alanine ethyl ester	2.09
$\alpha$ -Aminobutyric acid ethyl ester	2.13
$\alpha$ -Aminovaleric acid ethyl ester	2.13
Valine ethyl ester	2.11
$\alpha$ -Aminocaproic acid ethyl ester	2.13
$\beta$ -Alanine ethyl ester	2.14
$\beta$ -Aminobutyric acid ethyl ester	2.11

Accurate to  $\pm 0.01 \cdot 10^{-18}$  e. s. u.  
J. Wyman, Chem. Rev., 1936, 19, 213.

Dipole Moments of Amides

Urea	4.56
Thiourea	4.89
Symm.-dimethylurea	4.8
Tetraethylurea	3.3
Propylurea	4.1
Acetamide	3.6
Sulfamide	3.9
Benzamide	3.6
Valeramide	3.7
Caproamide	3.9

For comprehensive list of dipole moments see Trans. Faraday Soc., 1934, 30, General Discussion.

Dipole Moments of Some Hormones and Related Compounds in Dioxan

Cholestane-3( $\beta$ ):7( $\alpha$ )-diol	2.31
Cholestane-3( $\beta$ ):7( $\beta$ )-diol	2.55
Cholestane	2.98
$\Delta^4$ -Cholestane-3( $\beta$ )ol-7 one	3.79
Androsterone	3.70
$\beta$ -Androsterone	2.95
$\Delta^4$ -Androstene-3( $\beta$ ):17( $\alpha$ )-diol	2.89
$\Delta^4$ -Androstene-3( $\beta$ ):17( $\beta$ )-diol	2.69
$\Delta^4$ -Androstene-3( $\beta$ )ol-17 one	2.46
Testosterone	4.32
cis-Testosterone	5.17
$\Delta^4$ -Androstene-3:17 dione	3.32
Isophorone	3.96

Ethyleneic  $>C=C<$  in a six membered ring and conjugated with  $>C=O$  increases the dipole moment approximately by 1 Debye. Non-conjugated  $>C=C<$  in sterols decreases the dipole moment by approximately 0.49. Biological activity is not correlated with dipole moment. W. D. Kumler and G. M. Fohlen, J. Am. Chem. Soc., 1945, 67, 437.